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Assessment of sexual behavior and effect of semen collection pen design and sexual stimulation of boars on behavior and sperm output—a review

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Abstract

The importance of sexual behavior and factors influencing sexual behavior of AI boars has received minimal study. The majority of studies reviewed used a very small number of boars. A sexual behavior index (SBI) has been developed for naturally mating boars but not for AI boars. Some studies have reported significant correlations between sexual behavior traits and semen characteristics; while other studies did not find significant correlations. A new semen collection pen design (Reicks Design) has reduced the duration of time a boar requires to mount a dummy sow after entering the collection pen and the duration of time needed to exit the collection pen after ejaculation. In general, the observation of another boar mounted on the dummy sow prior to collection, releasing the penis after extension, exposing boars to non-estrous gilts for 2 days before collecting semen, placing a non-estrous gilt underneath a dummy, and removing the boar for 2 min after first mount did not enhance the number of sperm cells collected. Treatment of boars with PGF_{2α} has facilitated the training of sexually experienced boars to mount a dummy sow but not that of sexually inexperienced boars. In general, the treatment of boars with PGF_{2α} did not increase the total number of spermatozoa ejaculated.

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1. Introduction

The use of AI has greatly increased in many countries. During 2000, the United States Department of Agriculture conducted a survey of pork producers [1]. Their results indicated that 85.3% of the females were artificially inseminated on farms with an inventory of 500 or more sows and gilts. The increased use of AI has dramatically increased the number of boars needed for semen collection on a daily basis. The main objective of a boar stud is to produce a large volume of high-quality semen per boar in an efficient and safe manner. One factor that can influence how quick a boar mounts a dummy sow is the overall floor plan of the boar stud in combination with the design of the semen collection pen. Other factors that can influence the efficiency of a boar stud are proportion of boars trained to mount a dummy sow, proportion of boars willing to mount a dummy at each opportunity, and number of high-quality sperm cells ejaculated at each collection. A search of the scientific literature was conducted to find information related to assessment of sexual behavior, sexual stimulation procedures to enhance sexual behavior and sperm output, and design factors of a boar stud to enhance sexual behavior of boars.

2. Assessment of sexual behavior

2.1. Sexual behavior index

Sexual behavior of boars has received minimal study compared with sperm production and the biochemistry of semen. A generalized procedure for evaluating replacement boars for sexual behavior when naturally mating sows was reported by Levis in 1984 [2]. Levis et al. [3] developed the following equation to classify naturally mating boars as exhibiting a high, intermediate or low level of sexual behavior:

$$\begin{aligned} \text{SBI} = & [(DOE - \text{ETFM}) \div DOE] + (\text{TAGS} \div DOE) + (\text{TMNP} \div DOE) \\ & + [(\text{TNS} \div DOE) \times 2] + [(\text{TMWP} \div DOE) \times 3] + \{[(DOE \\ & - \text{ETC}) \div DOE] \times 5\} \end{aligned}$$

where SBI is the sexual behavior index score; DOE the duration of evaluation; ETFM the elapsed time to first mount; TAGS the time of anogenital sniffing; TMNP the time side and rear mounted with penis not exposed; TNS the time nosing side of female; TMWP the time side and rear mounted with penis exposed; ETC the elapsed time to copulation.

This equation was empirically developed to predict the sexual behavior and copulatory performance of boars. The index, composed of easily observed and recorded sexual behavior traits, was formulated to assign more emphasis to those traits expressed more frequently or more quickly during the evaluation period. Because three of the traits (TNS, TMWP and ETC) were assumed to have more influence on prediction of a successful copulation, these traits were more heavily weighed. Therefore, boars with the highest index score were those exhibiting the highest sexual activity. When using this equation, it was found that sexual behavior traits expressed by a boar are similar when evaluated with a tethered female for 5 min, a group of three females for 5 min, or a group of three females

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